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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,631	12/30/2003	Alex Nugent	1000-1216	7487

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EXAMINER	
TRAN, MAI T	

ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 06/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/748,631	NUGENT, ALEX	
	Examiner	Art Unit	
	Mai T. Tran	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4 IDS*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is responsive to application 10/748631, filed December 30, 2003.

Claims **1-20** are presented for examination.

INFORMATION DISCLOSURE STATEMENT

1. The information disclosure statement filed **January 29, 2004** fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

- Page 1 of 7: the document number 6,282,530 does not have the correct date. Therefore, the Examiner does not know which patent applicant is intended to list.
- Page 2 of 7: the document number EP 1 069 206 A2 does not have the correct date. Therefore, the Examiner does not know which patent applicant is intended to list.
- Page 3 of 7:
  - ❖ the other prior art "Nanotubes for Electronics", page 69 is missing.
  - ❖ the other prior art "Aligning single-wall carbon nanotubes with an alternating-current electric field" is missing.
- Page 4 of 7: the other prior art "Purification of Single Wall Carbon Nanotubes by Microfiltration", page 8842 is missing.
- Page 5 of 7:

- ❖ the other prior art "Evolution of Avalanche Conducting States in Electrorheological Liquids" is duplicate with item # 2 on page 4 of 7.
- ❖ the other prior art "Rapid Communication Orientation and Purification of Carbon Nanotubes Using AC Electrophoresis" is missing.

- Page 7 of 7: the other prior art "Building blocks for electronic spiking neural networks" is duplicate with the last item on this page.

2. The information disclosure statement filed **October 7, 2005** fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

- the other prior art "Nanoparticles Get Wired" is missing.

SPECIFICATION

The disclosure is objected to because of the following informalities: on page 2 of 100, paragraph [001]: "ant-Hebbian" is misspelled.

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

CLAIM REJECTIONS - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims **1-7, 9-11, and 13-20** are rejected under 35 U.S.C. 102(b) as being anticipated by "Solid-state thin-film memistor for electronic neural networks", by Thakoor et al, hereafter Thakoor.

Claim 1

Thakoor teaches a system, comprising:

a physical neural network configured utilizing nanotechnology (title), wherein said physical neural network comprises a plurality of nanoconductors which form neural connections between pre-synaptic and post-synaptic components of said physical neural network (page 3132, left column, lines 24-41); and

a learning mechanism for applying Hebbian learning to said physical neural network (page 3133, left column, lines 1-14).

Claim 2

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes a voltage gradient to implement Hebbian plasticity within said physical neural network (Figure 2).

Claim 3

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes voltage gradient dependencies associated with physical neural network to implement Hebbian learning within said physical neural network (Figure 2).

Claim 4

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes pre-synaptic and post-synaptic frequencies to provide Hebbian learning within said physical neural network (page 3132, left column, lines 24-41, page 3133, left column, lines 1-14).

Claim 5

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes a voltage gradient to implement anti-Hebbian plasticity within said physical neural network (Figure 2).

Claim 6

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes voltage gradient dependencies associated with physical neural network to implement anti-Hebbian learning within said physical neural network (Figure 2).

Claim 7

Thakoor teaches the system of claim 1 wherein said learning mechanism utilizes pre-synaptic and post-synaptic frequencies to provide anti-Hebbian learning within said physical neural network (page 3132, left column, lines 24-41, page 3133, left column, lines 1-14).

Claim 9

Thakoor teaches the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanowires (page 3133, left column, lines 4-5).

Claim 10

Thakoor teaches the system of claim 1 wherein said plurality of nanoconductors includes nanoconductors comprising nanoparticles (page 3133, left column, lines 4-5).

Claim 11

Thakoor teaches a system, comprising:

a physical neural network configured utilizing nanotechnology (title), wherein said physical neural network comprises a plurality of nanoconductors which form neural connections between pre-synaptic and post-synaptic components of said physical neural network (page 3132, left column, lines 24-41); and

a learning mechanism for applying Hebbian learning to said physical neural network wherein said learning mechanism utilizes a voltage gradient or pre-synaptic and post-synaptic frequencies thereof to implement Hebbian or anti-Hebbian plasticity within said physical neural network (page 3133, left column, lines 1-14).

Claim 13

Thakoor teaches the system of claim 11 wherein said plurality of nanoconductors includes nanoconductors comprising nanowires (page 3133, left column, lines 4-5).

Claim 14

Thakoor teaches the system of claim 11 wherein said plurality of nanoconductors includes nanoconductors comprising nanoparticles (page 3133, left column, lines 4-5).

Claim 15

The system of claim 11 wherein said plurality of nanoconductors are disposed within a dielectric medium (page 3133, left column, lines 1-14).

Claim 16

Thakoor teaches the system of claim 15 wherein said plurality of nanoconductors form physical neural connections when said dielectric medium is exposed an electric field, such that said physical neural connections can be strengthened or weakened depending upon a strengthening or weakening of said electric field or an alteration of a frequency thereof (page 3133, left column, lines 1-14).

Claim 17

Thakoor teaches a system, comprising:

a plurality of molecular conductors disposed within a dielectric medium (page 3133, left column, lines 1-14);

at least one input electrode in contact with said dielectric medium (page 3133, left column, lines 1-14); and

at least one output electrode in contact with said dielectric medium, wherein said plurality of molecular conductors form physical neural connections when said dielectric medium is exposed an electric field across said at least one input electrode and said at least one output electrode, such that said physical neural connections can be strengthened or weakened depending upon a strengthening or weakening of said electric field or an alteration of a frequency thereof (page 3132, left column, lines 24-41, page 3133, left column, lines 1-14).

Claim 18

Thakoor teaches the system of claim 17 further comprising a physical neural network comprising said plurality of molecular conductors disposed within a dielectric medium, said at least one input electrode in contact with said dielectric medium, and said at least one output electrode in contact with said dielectric medium (page 3133, left column, lines 1-14).

Claim 19

Thakoor teaches the system of claim 18 further comprising a learning mechanism for applying Hebbian learning to said physical neural network wherein said learning mechanism utilizes a voltage gradient or pre-synaptic and post-synaptic frequencies thereof to implement Hebbian or anti-Hebbian plasticity within said physical neural network (Figure 2).

Claim 20

Thakoor teaches the system of claim 18 wherein said physical neural network is configured as an integrated circuit chip utilizing nanotechnology (Figure 3).

CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims **8 and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakoor as applied to claims 1-7, 9-11, and 13-20 above, and further in view of "Computational Nanotechnology with Carbon Nanotubes and Fullerenes", by Deepak Srivastava et al, hereafter Srivastava.

Thakoor teaches a physical neural network configured utilizing nanotechnology wherein said physical neural network comprises a plurality of nanoconductors but fails to disclose said plurality of nanoconductors includes nanoconductors comprising nanotubes.

Srivastava teaches computational nanotechnology with carbon nanotubes and fullerenes (title).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine the physical neural network utilizing nanotechnology of Thakoor with the carbon nanotubes of Srivastava. The motivation for doing so would be to perform complex computing and switching applications in a single pass and also, the signals propagated, branched, and switched on such a network need not be restricted to the "electronic" regime (page 52, left column, lines 3-11).

CONCLUSION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571) 272-4238. The examiner can normally be reached on M-F 9:00am-- 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M.T.T
Patent Examiner
Date: 6/02/2006

6/26/06
David Vincent
Supervisory Patent Examiner
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